

New synonymies in *Sphecodes* Latreille, 1804 (Hymenoptera, Apoidea, Halictidae) species from Italy, with taxonomic notes on type material

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Abstract

Type specimens of the bee genus *Sphecodes* Latreille, 1804 (Hymenoptera: Halictidae), described by Vittorio Nobile and Giuseppe Fabrizio Turrisi from Italy and deposited in the Zoologische Staatssammlung, München, Germany, were studied. Detailed information on the primary types of the six nominal species and their illustrations are provided. *Sphecodes banaszaki* Nobile & Turrisi, 2004, **syn. nov.**, *S. marcellinoi* Nobile & Turrisi, 2004, **syn. nov.**, *S. walteri* Nobile & Turrisi, 2004, **syn. nov.**, *S. iosephi* Nobile & Turrisi, 2004, **syn. nov.**, and *S. tomarchioi* Nobile & Turrisi, 2004, **syn. nov.**, are all synonymized with *Sphecodes combai* Nobile & Turrisi, 2004, which is rediagnosed. Also accepted synonymy of *S. campadellii* Nobile & Turrisi, 2004 = *S. geoffrellus* (Kirby, 1802), previously suggested by M. Schwarz's and F. Gusenleitner's (2012).

Keywords

Anthophila, Apiformes, cleptoparasites, synonymy, taxonomy

Introduction

One of controversial problems in the taxonomy of European species of the genus *Sphecodes* Latreille, 1804 (Hymenoptera: Halictidae) is the status of the species described by Italian researchers V. Nobile and G.F. Turrisi (2004) from Italy. They described seven new species (each from a single male), attributing them to the *Sphecodes pinguius* Pérez, 1903 species group. It was not surprising that the description of several new species from this difficult genus at once in within a fairly well-studied European fauna (four of them from the same type locality) attracted attention. A few years later their type specimens were examined by Austrian researchers M. Schwarz and F. Gusenleitner (2012). As a result, they were all synonymized with two other widespread Palaearctic species: *S. campadellii* Nobile & Turrisi, 2004 with *S. geoffrellus* (Kirby, 1802), and the other six species, *S. combai* Nobile & Turrisi, 2004, *S. banaszaki* Nobile & Turrisi, 2004, *S. marcellinoi* Nobile & Turrisi, 2004, *S. walteri* Nobile & Turrisi, 2004, *S. iosephi* Nobile & Turrisi, 2004, and *S. tomarchioi* Nobile & Turrisi, 2004 with *S. marginatus* Hagens, 1882.

Nevertheless, a year later, that taxonomic action was challenged by the authors of the Italian species (Nobile and Turrisi 2013), who restored their valid status. Jakub Straka (Prague, Czech Republic) also studied these types; he was convinced that only *S. combai* is a distinct, valid species from the *S. marginatus* species group (personal communication of J. Straka); however, he did not publish that in the review of the European *Sphecodes*, see Bogusch and Straka (2012: 2). *Sphecodes combai* occurs in Italy from Sicily all the way north to the border with Switzerland, and was also found in Greece (Bogusch and Straka 2014).

Thus, there are several points of view on the taxonomic status of the *Sphecodes* species described by Nobile and Turrisi (2004), so we decided to readdress this matter. We reexamined the holotype specimens of *S. combai*, *S. banaszaki*, *S. marcellinoi*, *S. walteri*, *S. iosephi*, and *S. tomarchioi* in Zoologische Staatssammlung, München, Germany (ZSM). The holotype of *S. campadellii* was stated in the original description as being deposited in the Istituto di Entomologia, Università di Bologna, Italy (IUB); however, it has not been found either there (personal communication of G.F. Turrisi) or in ZSM (personal communication of O. Schmidt), although the later depository was mentioned by Schwarz and Gusenleitner (2012) and Nobile and Turrisi (2013).

We agree with the opinion of J. Straka about the validity of *S. combai* and also accept M. Schwarz's and F. Gusenleitner's point of view that the holotype specimens of the other five Italian species (except *S. campadellii*) are conspecific with it, hence the proposed new synonymies.

Materials and methods

The ventral surface of some flagellomeres bear a distinctive patch of sensilla trichodea A (sensu Årgent and Svensson 1982), which we refer to as 'tyloids', these sensilla are easily observable under a microscope. Abbreviations F and T are used for flagellomere

and metasomal tergum, respectively. Density of integumental punctures is described using the following formula: puncture diameter (in μm) / ratio of distance between punctures to average puncture diameter, e.g., 15–20 μm / 0.5–1.5.

Specimens were studied with a Leica M205A stereomicroscope and photographs were taken with a combination of stereomicroscope (Olympus SZX10) and digital camera (Olympus OM-D and Canon EOS70D). Final images are stacked composites using Helicon Focus 6 software. All images were post-processed for contrast and brightness using Adobe Photoshop.

Taxonomy

Sphecodes combai Nobile & Turrisi, 2004

Fig. 1

Sphecodes combai Nobile & Turrisi, 2004: 119–120, ♂. Holotype: ♂, Italy, Lazio, Albani Hills, Cecchina, Poggio Ameno, 280 m, 1.X.1990, M. Comba, on *Hedera helix* L. (ZSM), examined.

Sphecodes banaszaki Nobile & Turrisi, 2004: 120–121, ♂. Holotype: ♂, Italy, Lazio, Albani Hills, communal forest of Albano, 480 m, 23.VI.1995, M. Comba (ZSM), examined, illustrated in Fig. 2. – Syn. nov.

Sphecodes marcellinoi Nobile & Turrisi, 2004: 121–122, ♂. Holotype: ♂, Italy, Sicily, Mount Etna, Piano Vetore, 1700 m (Ragalna), 2.V.1999, S. Tomarchio (ZSM), examined, illustrated in Fig. 3. – Syn. nov.

Sphecodes walteri Nobile & Turrisi, 2004: 122–123, ♂. Holotype: ♂, Italy, Sicily, Mount Etna south slope, near da Milia, 1500 m (Ragalna), 10.VIII.1999, S. Tomarchio (ZSM), examined, illustrated in Fig. 4. – Syn. nov.

Sphecodes iosephi Nobile & Turrisi, 2004: 123–124, ♂. Holotype: ♂, Sicily, Mount Etna, south slope, near da Milia, 1400 m (Ragalna), 10.VIII.1999, S. Tomarchio (ZSM), examined, illustrated in Fig. 5. – Syn. nov.

Sphecodes tomarchioi Nobile & Turrisi, 2004: 124–125, Italy, ♂. Holotype: ♂, Sicily, Mount Etna, south slope, near da Milia, 1400 m (Ragalna), 10.VIII.1999, S. Tomarchio (ZSM), examined, illustrated in Fig. 6. – Syn. nov.

Diagnosis. Morphologically, *S. combai* is similar to members of the *S. miniatus* Hagens, 1882 species group, i.e. *S. creticus* Warncke, 1992, *S. haladai* Warncke, 1992, *S. larochei* Warncke, 1992, *S. marginatus* Hagens, 1882, *S. miniatus* Hagens, 1882, *S. nomioidis* Pesenko, 1979, *S. schwarzi* Astafurova & Proshchalykin, 2014, and *S. sandykachi* Astafurova & Proshchalykin, 2018 (see Astafurova et al. 2018). However, this species clearly differs from other species of this group by F2 with tyloids covering the entire ventral flagellar surface (versus glabrous F2 or F2 with tyloids covering only the basal part of F2, Fig. 7B, C). This character was also pointed out by Nobile and Turrisi (2013) as a clearly distinguishing one from *S. marginatus*. Another important feature mentioned by these Italian researchers is the gonostylar shape. Although being very

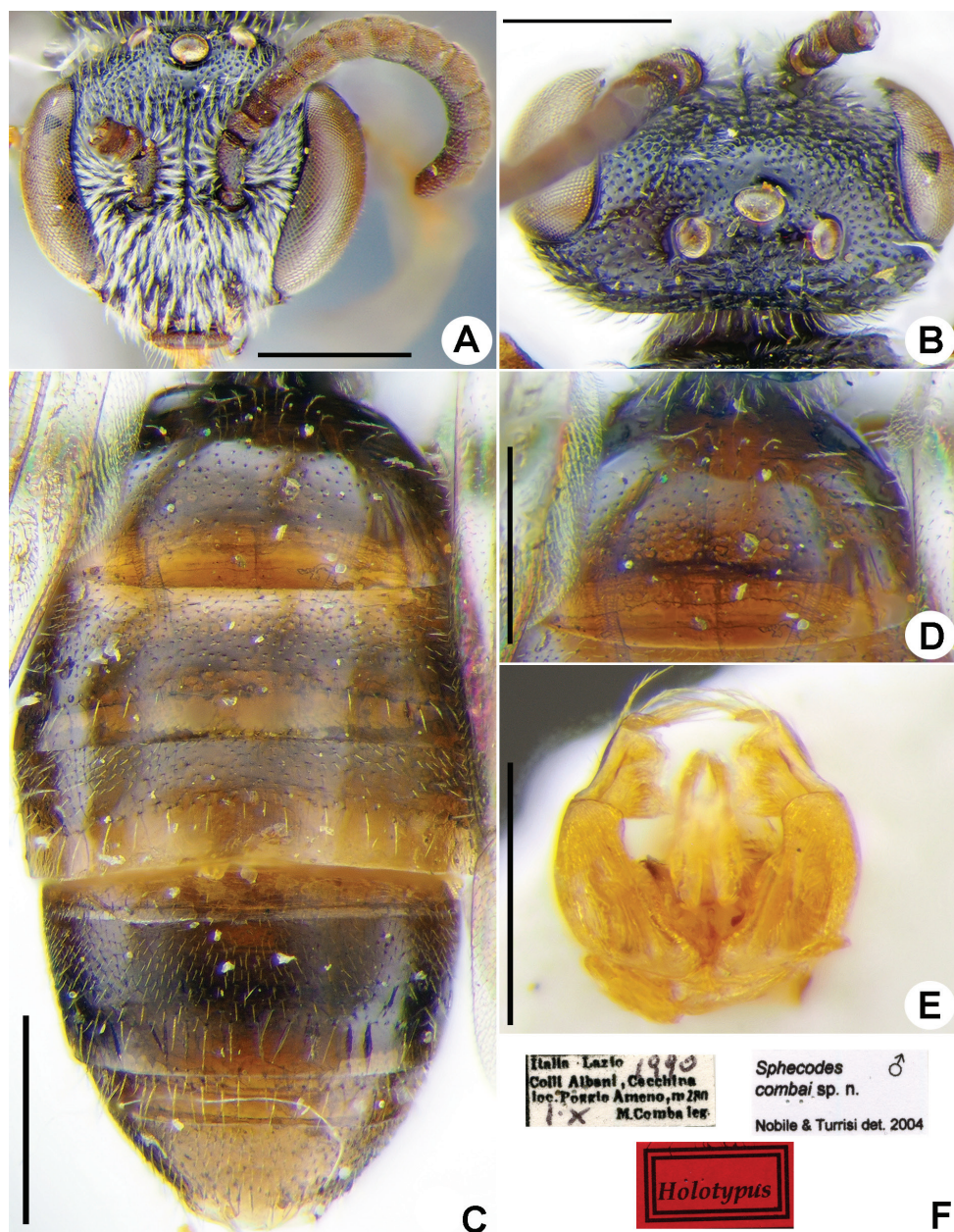


Figure 1. *Sphecodes combai* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

similar in these two species, in *S. marginatus* it is relatively smaller and close to the triangular membranous portion of the gonostylus (Fig. 7D), distinguishes, *S. combai* from its trapezoidal membranous portion is larger (Fig. 1E). Thus, its shape is most similar to that in *S. nomioidis* (Fig. 7E), although the position of the gonostylus or

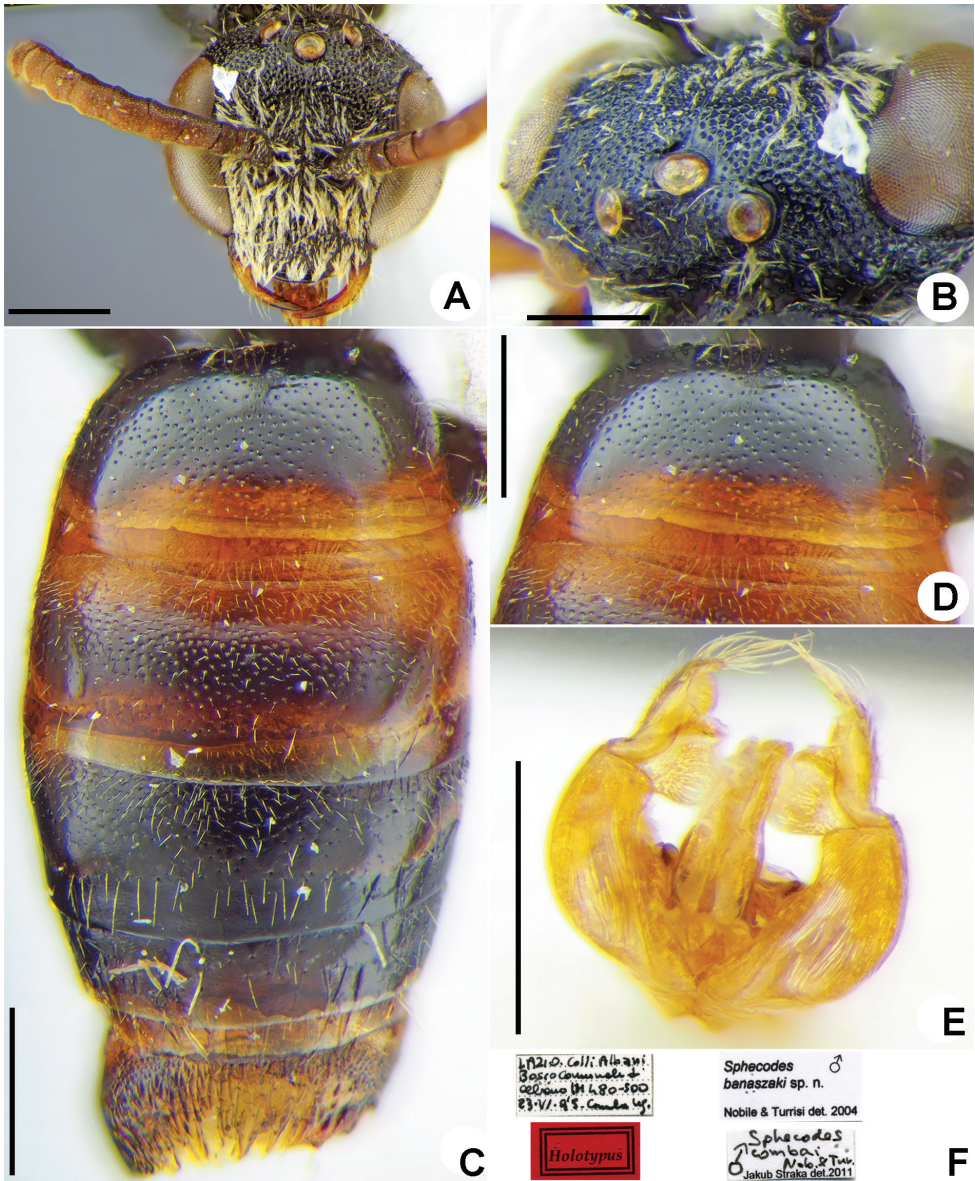


Figure 2. *Sphecodes banaszaki* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

deformation of the genitalia in some specimens can significantly complicate proper usage of this feature. In fact, we could not clearly differentiate between *S. combai* and *S. nomioidis*, except by F2 tyloids (F2 is entirely glabrous in *S. nomioidis*).

Based on antennal morphology, Nobile and Turrisi (2004, 2012) referred *S. combai* (and the other six species described in 2004) to the *S. pinguiculus* Pérez, 1903 species group (i.e., to the same group with *S. pinguiculus* and *S. intermedius* Blüthgen, 1923).

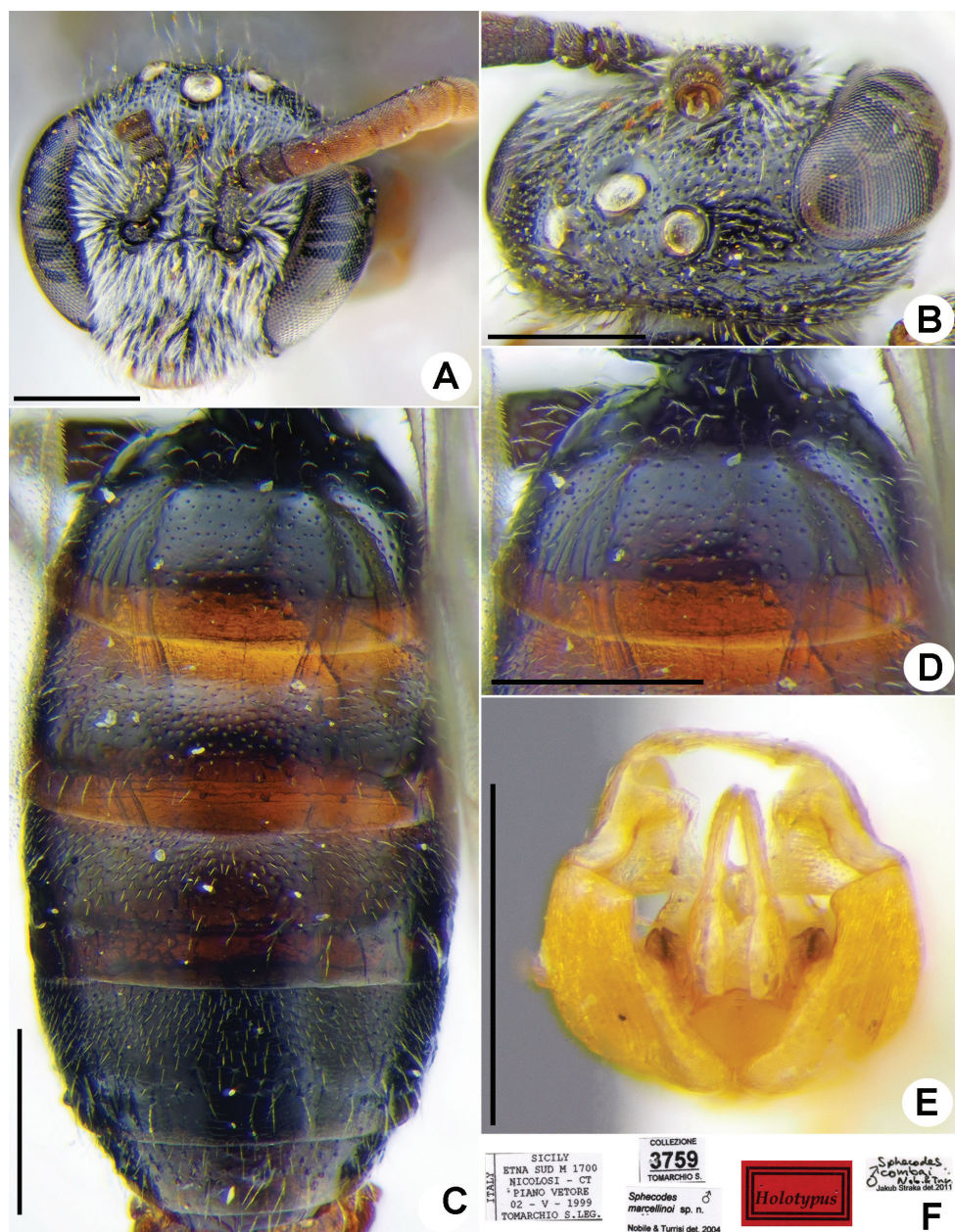


Figure 3. *Sphecodes marcellinoi* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

Although *S. pinguiculus* and *S. intermedius* also have a similar T2 with tyloids usually covering the entire ventral flagellar surface (sometimes T2 is entirely or partially glabrous in *S. intermedius*), *S. combai* differs from these species by a shorter antenna with flagellomeres being 1.1–1.2 times as long as wide (versus 1.4–1.7, Fig. 7A), a shorter

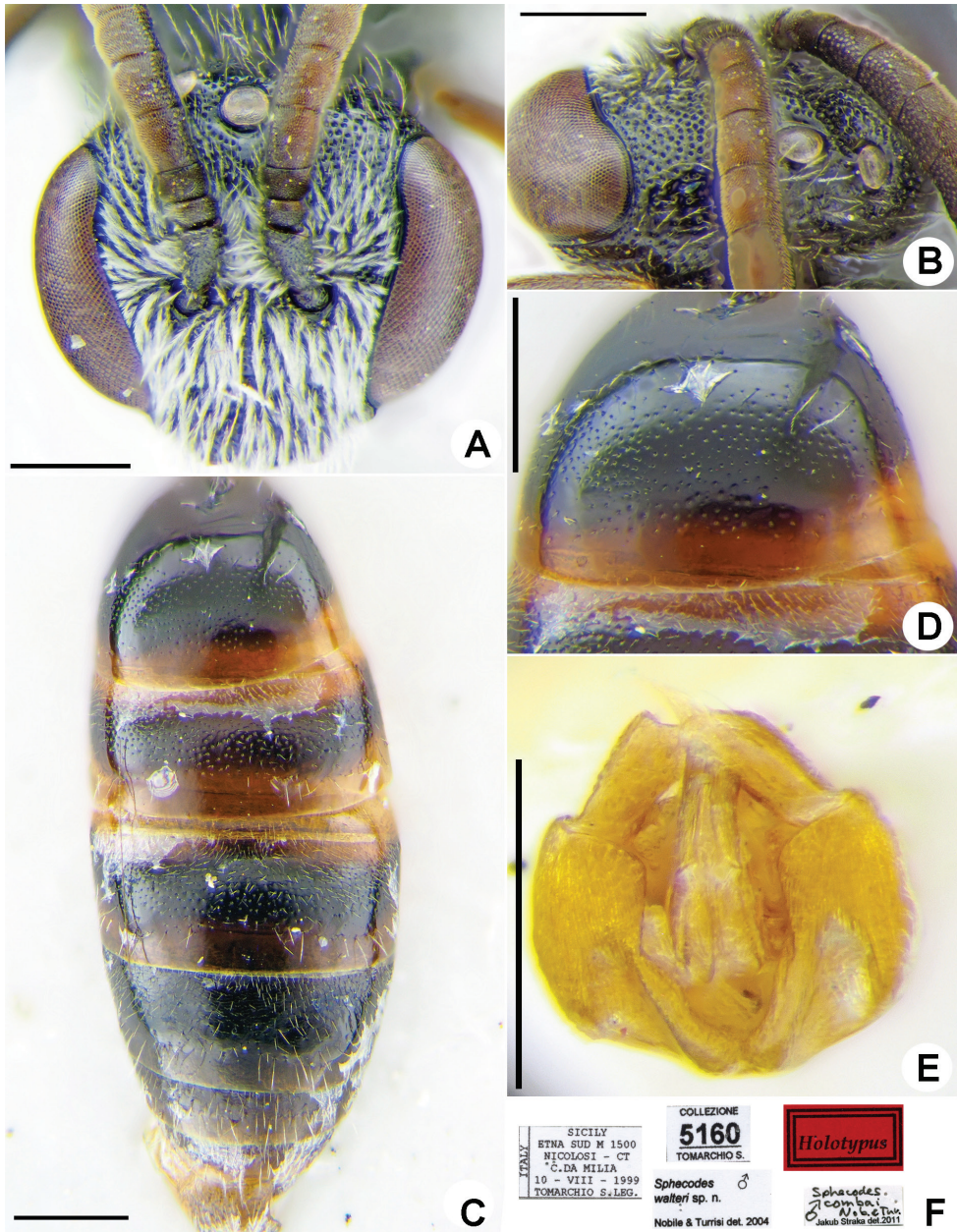


Figure 4. *Sphecodes walteri* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

vertex (the distance from top of the head to the upper margin of the lateral ocellus, being about two lateral ocellar diameters as seen in dorsal view, versus 2.5–3), the face above the antennal sockets with sparser and shorter pubescence partially obscuring the integument (versus dense long pubescence entirely obscuring the integument,

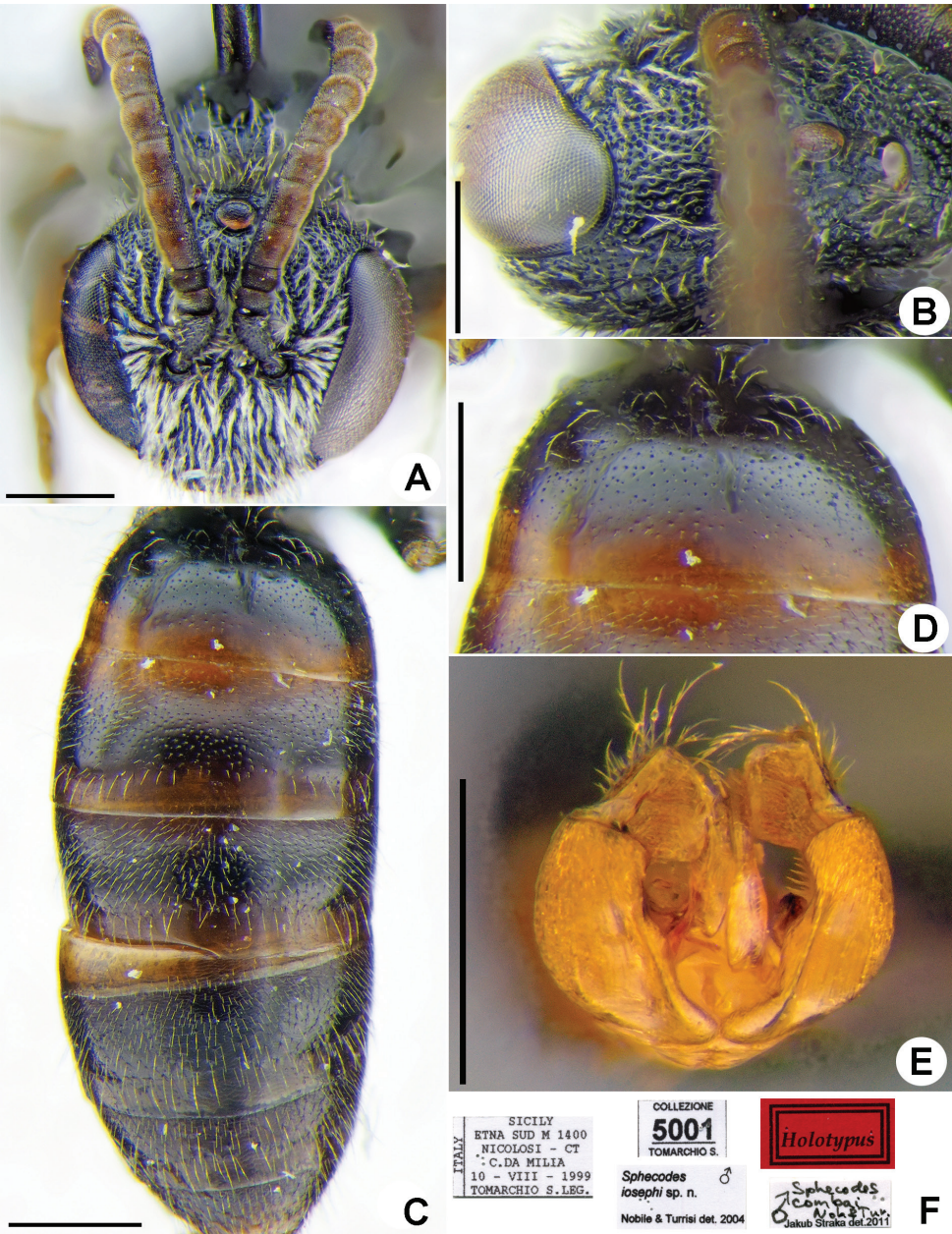


Figure 5. *Sphecodes iosephi* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

Fig. 7A), and a more sparsely and finely punctate T1 with punctures separated by 2–5 puncture diameters (versus at most 2). So, possible placement of *S. combai* to the *S. pinguiculus* species group is doubtful and would be premature without taking into account the female morphological features. Besides, morphologically it is more similar

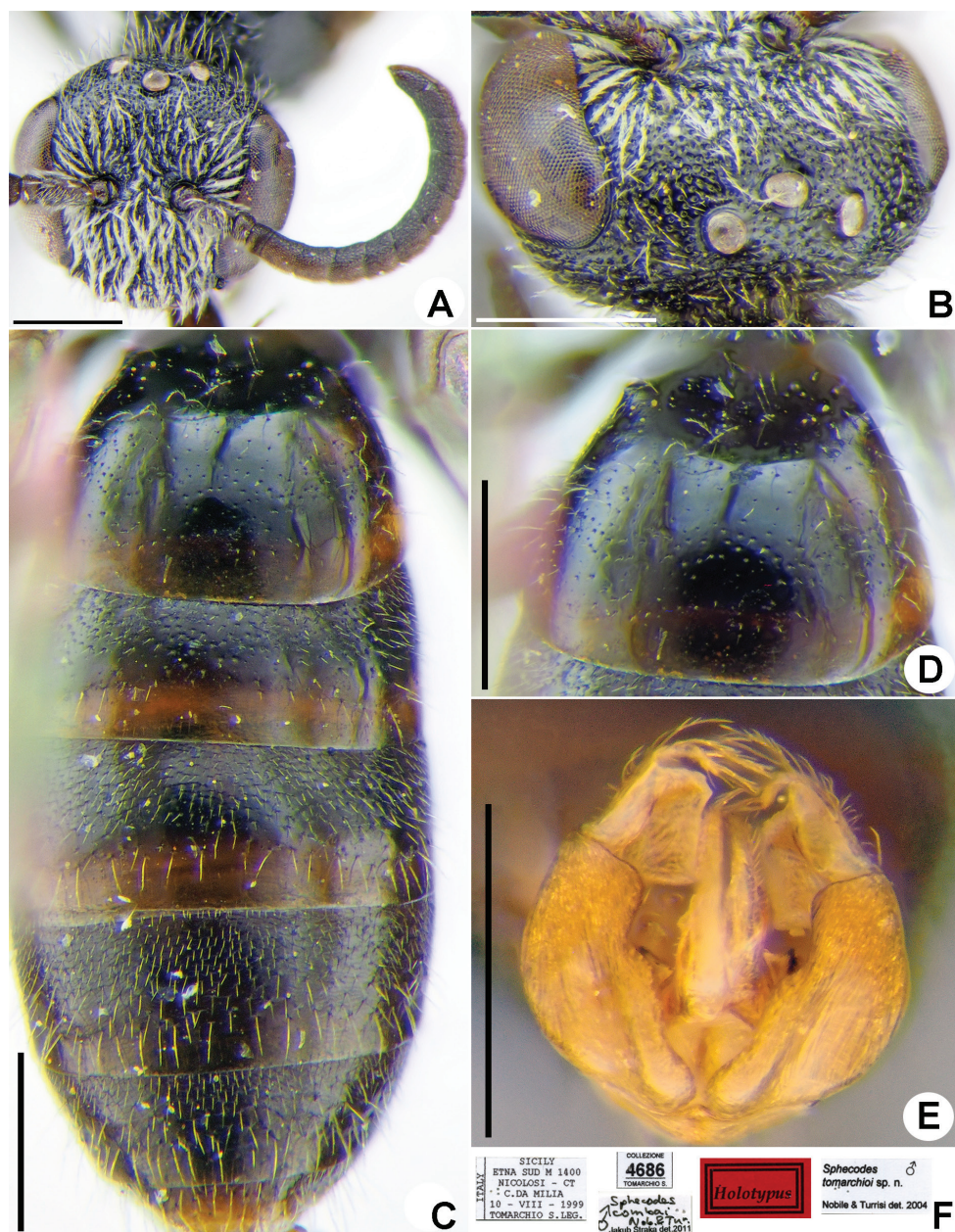


Figure 6. *Sphecodes tomarchioi* Nobile & Turrisi, 2004, holotype, male **A** head, frontal view **B** vertex, dorsal view **C** metasoma, dorsal view **D** T1, dorsal view **E** genitalia, dorsal view **F** labels. Scale bars: 0.5 mm.

to *S. marginatus* and *S. nomioideis*, so most likely *S. combai* belongs to the same group with the latter two species.

Female. The female of *S. combai* has not been described, but we examined two from Italy (1 ♀, Emilia Romagna, Comacchio, VII.2001, M. Richa, and 1 ♀, Sic-

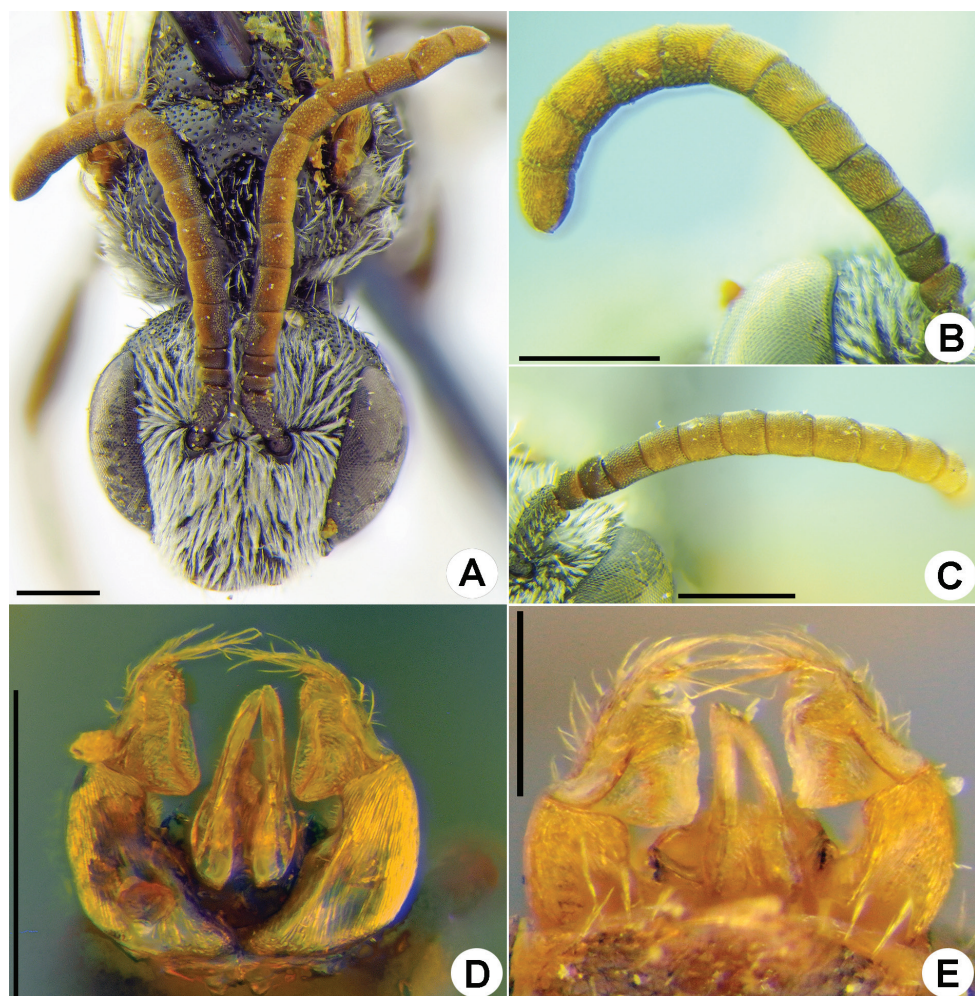


Figure 7. *Sphecoides pinguiculus* Pérez, 1903 (**A**), *S. marginatus* Hagens, 1882 (**B**, **D**), and *S. nomioideis* Pesenko, 1979 (**C**, **E**), males **A** head, frontal view **B**, **C** antennae, lateral view **D**, **E** genitalia, dorsal view. Scale bars: 0.5 mm.

ily, Naxos Strand, 17.V.1961, J. Gusenleitner), both in the personal collection of M. Schwarz, Ansfelden, Austria) determined by J. Straka (in 2012) as *S. combai*. These specimens are very similar to *S. marginatus*, but with a relatively denser punctate ocello-ocular area. It is likely that these two female specimens belong to *S. combai*, thus providing an additional indication that this species is likely to belong to the informal *S. miniatus* species group. However, we refrain from describing the female sex of this species based on specimens not in the same series with conspecific males. In addition, if the assumption that *S. combai* belongs to the *S. miniatus* species group is correct, then the female of *S. combai* may have very weak morphological differences from the other

Table 1. Differences of *Sphecodes combai* from other species of the *S. miniatus* species group described by Nobile and Turrissi (2004).

Characters	F2	Ocello-ocular area	Upper half of frons (below ocelli)	T1	Coloration of terga	Type locality
Holotype specimens						
<i>S. combai</i> (Fig. 1)	1.1	ca 10 μ m / 1–3	10–15 μ m / confluent–1	5–10 μ m / 2–5	red-brown with lighter marginal zones	Lasio, Albani Hills
<i>S. banaszaki</i> (Fig. 2)	1.2	10–15 μ m / 0.5–2	10–15 μ m / less 0.5	5–12 μ m / 1–3	T1–T2 dark red-brown with reddish marginal zones, T3–T4 black, T5 reddish	Lasio, Albani Hills
<i>S. marcellinoi</i> (Fig. 3)	1.2	10–15 μ m / 1–2	ca 10 μ m / 0.5–2	ca 5 μ m / 2–6	dark red-brown with reddish T1–T2 marginal zones	Sicily, Mount Etna
<i>S. walteri</i> (Fig. 4)	1.2	ca 10 μ m / 1–3	ca 10 μ m / 0.5–1	ca 5 μ m / 2–6	dark brown with reddish T1–T3 marginal zones	Sicily, Mount Etna
<i>S. iosephi</i> (Fig. 5)	1.2	10–15 μ m / confluent–1	10–15 μ m / less 0.5	ca 5 μ m / 2–6	dark red-brown with reddish T1–T3 marginal zones	Sicily, Mount Etna
<i>S. tomarchioi</i> (Fig. 6)	1.2	ca 10 μ m / 1–2	10–15 μ m / less 0.5	ca 5 μ m / 3–6	dark brown with lighter T1–T3 marginal zones	Sicily, Mount Etna

members of this group. Therefore, description of the other sex of *S. combai* may also require additional genetic evidence, which is now unfortunately lacking for both sexes.

Synonymy. Most species of *Sphecodes* exhibit a considerable intraspecific variation. While studying numerous specimens from various parts of the Old World we have observed variation in the body size, sculpture, coloration, and sometimes degree of development of the tyloids and relative length of the flagellomeres. Intraspecific versus interspecific variation in body size *Sphecodes* is an interesting topic that warrants a further, thorough investigation, including using molecular methods.

Indicated differences between the seven nominal species described by Nobile and Turrissi (2004) were based on sculpture (of the vertex, frons, T1), coloration (of the mandibles, antennae, metasoma and legs) and the gonostylar shape. We have reexamined the holotypes of *S. banaszaki*, *S. tomarchioi*, *S. iosephi*, *S. walteri*, *S. marcellinoi*, *S. combai* and concluded that the minor morphological differences between them can be considered as intraspecific variation, as also pointed out by Schwarz and Gusenleitner (2012).

The main differences between the primary type specimens examined are outlined in Table 1. The holotype of *S. marcellinoi* has a sparser punctation on the upper half of the frons; tergal coloration of the holotype of *S. combai* is lighter and reddish; the holotype of *S. banaszaki* is larger (6 mm versus 4–5 mm) and with coarser and denser T1 punctation; the holotype of *S. iosephi* has a denser punctate ocello-ocular area and mandibles medially dark yellow (not entirely black as incorrectly indicated in the original description). The slight differences in the gonostylar shape, as illustrated by Nobile and Turrissi (2004), are the result of a deformation and different position of the gonostylus relative to the axis of genitalia, see also Schwarz and Gusenleitner (2012).

On the other hand, such a rare feature as F2 with tyloids covering the entire ventral flagellar surface not only distinguishes the six nominal species of *Sphecodes* described by Nobile and Turrissi (2004) from Italy from the other Palaearctic species quite well, but also more likely (also based on their morphological similarity) indicates their conspecificity within *S. combai*.

Sphecodes geoffrellus (Kirby, 1802)

Melitta geoffrella Kirby, 1802: 45, ♀ (type locality: England).

Sphecodes affinis Hagens, 1882: 224, ♀, ♂ (type locality: Germany).

Sphecodes fasciatus Hagens, 1882: 224, ♂ (type locality: Germany).

Sphecodes rimalis Pérez, 1903: 221, ♀ (type locality: France).

Sphecodes impunctatus Meyer, 1922: 171, ♂ (type locality: Russia).

Sphecodes silvicola Tsuneki, 1983: 60, ♀ (type locality: Japan).

Sphecodes shirozui Tsuneki, 1983: 53, ♂ (type locality: Japan).

Sphecodes kitamius Tsuneki, 1983: 55, ♂ (type locality: Japan).

Sphecodes campadellii Nobile & Turrise, 2004: 118–119, Fig. 1, ♂. Holotype: ♂, Italy, Emilia Romagna, Zocca (Modena), 8.VIII.1962 (collection of the Institute of Entomology “G. Grandi”, University of Bologna, Italy). Junior subjective synonym of *S. geoffrellus* (Kirby, 1802) according to Schwarz and Gusenleitner (2012: 74).

Remark. We have not reexamined the holotype of *S. campadellii* because it has not been found in IUB/ZSM and probably is lost. However, we agree with its synonymy with *S. geoffrellus* as previously suggested by Schwarz and Gusenleitner (2012) based on type studies.

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